

2001

Classroom Technology: The Shaping Of Our Future

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CLASSROOM TECHNOLOGY: THE SHAPING OF OUR FUTURE

BY

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**Submitted in partial fulfillment of the requirements
for the Master of Arts in Corporate and Public Communication
Seton Hall University**

2001

Author's Note

The author wishes to acknowledge the professionals and family that supported the creation of this study. Specifically, the author would like to express appreciation to her advisor, Dr. McGraw, for his constant enthusiasm and guidance. In addition, the author would also like to acknowledge the support and encouragement of her parents, Steve and Carol Bannon.

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Chapter I

INTRODUCTION

According to Gerstner (1994), most Americans believe that “public education should prepare young people for three roles: citizens of democracy, workers in a complex economy, and participants in a larger society” (p. 183). Today, citizens, workers, and society alike have engaged in the information revolution. This revolution is made up of vast information that can now be communicated faster, more cheaply, and to more people.

The computer has entered our schools in the attempt to prepare America’s students for this new society. Gerstner (1994) states, “Today at least, education for citizenship and for personal fulfillment is much the same as education for economic life, because the skills and knowledge you need are the same” (p. 184). Furthermore, as computers play an ever-larger role in society, students must understand and be able to take advantage of the potential of technology as a prerequisite for a successful career.

On March 9, 1996, the Clinton Administration made a commitment to the people of the United States to make Internet access a priority. Then President Clinton visioned a program that would transform schools into “21st-century learning institutions” (Furger, 1999, p. 149). In 1994, only about one in three schools, and just three percent of classrooms, were wired to the Internet. But by 1999, 95 percent of schools—and 63 percent of all classrooms—had Internet access” (Kelly, Lord, & Marcus, 2000, p. 50).

President Clinton has not been the first public figure to emphasize the educational value of telecommunications. For most of the 20th century, the roles of technology in U.S. schools have been a welcomed addition to our culture.

In 1922, Thomas Alva Edison (as cited in Stoll, 1999) stated: "The motion picture is destined to revolutionize our educational system...in a few years it will supplant largely, if not entirely, the use of textbooks" (p. 35).

A decade later, Benjamin Darrow (as cited in Stoll, 1999), founder of the Ohio School of the Air, wrote: "The central and dominate role of education by radio is to bring the world to the classroom, to make universally available the services of the finest teachers, the inspiration of the greatest leaders...unfolding world events through the radio may come as a vibrant and challenging textbook of the air" (p. 35).

Postman (1995) believes that these views are a search for technological panaceas. Postman states, "I do not go back as far as the introduction of the radio, but I am old enough to remember when 16-millimeter film was to be the sure cure, then closed-circuit television, then 8-millimeter film, then teacherproof text-books. Now computers" (p. 50). Whether or not one agrees with Postman's opinion, Leu (2000) has reported that the rate at which the Internet is appearing in school classrooms far exceeds the rate at which any other technology of literacy has ever appeared in our history (p. 2).

Today's revolutionaries believe that computers are tools that provide exceptional opportunities to the entire educational system. "The analogy of computer as a tool is limited. What a computer can do—what no hand can do—is shape the material it is provided with independently of the user, make suggestions, and in many ways approximate the functioning of the mind itself" (Gooden, 1996, p. 16).

This study explores the roles that computers can play in developing key skills in our children's future. These key skills include those related to communication and

critical thinking skills. The study outlines the importance of achieving these skills as well as examines the educator's responsibilities in the realm of the age of the Internet.

Research Question

Will the technological revolution of the Internet in our educational system adequately prepare children to effectively perform in the workplace? This study focuses on the effectiveness of information technology integrated in a select group of fifth through ninth grade classrooms.

Subsidiary Questions

The author's objective in embarking on this study is to find answers to the following questions:

1. Are educators teaching their students critical thinking skills in determining the usefulness and credibility of information on the Internet?
2. In what ways should the Internet be taught to grade schools students in order to achieve effective communication later on in the workplace?
3. How important do American workers rate computer skills as a required job performance function?

Purpose of the Study

In this study, the author explores the roles that specific technologies can play in helping prepare students for the workplace. "It is not just our classrooms that are changing. The world for which we prepare our children is also undergoing a fundamental

transformation" (Leu, 2000, p. 3). Blasi, Milman, and Washington (1999) believe that what is needed more than anything else is a new set of clear learning outcomes for students who must live in a complex world.

American workers depend on the U.S. educational system to teach students the professional skills they need to succeed at work. According to the National Association of Colleges and Employers Organization (NACE) (as cited in Cooke, 1997), "those who hire consistently rank oral communication, interpersonal skills, and problem solving skills as the top three attributes they seek in applicants" (p. 58).

Furthermore, the United States government report from the Department of Labor (1992) and the Secretary's Commission on Achieving necessary Skills (SCANS), find importance in students being taught critical thinking skills needed to meet information competency in the new Information Age. These skills include "acquiring and evaluating information, organizing and maintaining information, interpreting and communicating information, and using computers to process information" (Depalo & Kibirige, 2000, p. 13).

According to an article in the Washington Post (Cooper, 2000) children growing up in the new millennium will be exposed, almost from infancy, to a vast pool of education and information sources. "With this emerging scenario, it is important for students to learn how to make valuable decisions in the information-gathering process" (p. A02).

Need for Study

According to Bergman, Knuth and Law (1992), concern about the transition from school to work in America goes at least as far back as the Land Grant College movement

of the mid-1800s. By 1900, the focus had shifted to the secondary schools. The most powerful criticism came from businessmen, industrialists, and educational leaders who contended that the public secondary instructional programs were not useful in daily life nor did they contribute to success in future occupations.

Today, in the 21st century, businesses voice similar concerns about our education system. A cover story in Business Week, titled "Will Schools Ever Get Better?" stated, "Americans are fed up with their public schools. Businesses complain that too many job applicants can't read, write, or do simple arithmetic. Economists fret that a weak school system is hurting the ability of the U.S. to compete in the global economy" (Mandel, Melcher, Yang, & McNamee, 1995, p. 64).

So what should our schools do about the situation? From all perspectives, the most critical task for a school must be to prepare children for the world they will face upon graduation. Changes in competition, careers, and technology are all part of that changed landscape. The National Alliance of Business (1991) stated,

Today, not some time in the future, our nation must educate all of its children to be critical thinkers. We no longer have a choice. We must end the crisis if we are to remain a first class nation and compete in a world economy...This failure is the result of a web of educational theories, philosophies, policies, and organizational structures that inhibit change. It is not that the schools are doing a worse job than in the past. It is that the whole world has changed, while our schools have stayed largely the same. (p. 1)

Objectives

This research is built on a foundation of three objectives. The first part of the research seeks to present a review of the major components of classroom technology literature. The second part of the research is primarily to point out what the author sees as the present situation of technology usage in local schools. Finally, the third part of the research is to propose a solution of how educators can incorporate 21st century learning into the classroom. The past research and theorizing has been extremely valuable as a start to this task. But repeating the past tests and methods will not do much to advance our understanding. This author believes society needs to make many adjustments to get beyond our historical focus on traditional classroom learning and shift our attention more into explaining the how and why 21st century learning is needed in student's lives.

Definition of Terms

1. Critical thinking. Critical thinking is purposeful, self-regulatory judgement which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgement is based. The ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgements, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are precise as the subject and the circumstances of inquiry permit (Facione, 1990, p. 4).

2. Evaluation. To assess the credibility of statements or other representations

which are accounts or descriptions of a person's perception, experience, situation, judgement, belief, or opinion; and to assess the logical strength or the actual or intended inferential relationships among statements, descriptions, questions or other forms of representation (Facione, 1990, p. 4).

3. Global (new) economy. An economy is a system for the creation and distribution of wealth. The global economy is based on human capital and networks. In this economy, knowledge permeates through everything important: people, products, and organizations (Tapscott, 1998, p. 127).

4. Revolution. Revolution is the displacement of traditional modes of thought and actions (Savage & Vogel, 1996, p. 128).

5. Technology. Technology is an innovative process linking teaching and learning outcomes (Blasi, et al., 1999, p. 7).

Limitations

There are two limitations in this study. The first of these limitations is that research has provided a great deal of knowledge about computer usage in the classroom. This is especially true with technology as a learning tool (Chapter II), and the immediate effects, as well as long term effects, of technology (Chapter III). While social science has great value in increasing our understanding of the pros and cons of classroom technology, it has its shortcomings. But the current shortcomings in the literature are not attributable to inherent limitations in social science methodologies of content analysis, experiment, or survey. Instead, the shortcomings reflect the difference between where social scientists want to be and what they have been able to accomplish in the relatively short time they

have been working on the technological phenomenon in our nation's society. These social science methodologies have not yet been used to their full potential in increasing our understanding of using technology as a tool for developing better prepared students for the future. In addition, because it wasn't until 1999 that 95% of the nation's schools were wired to the Internet, scientists will not know all of its effects in job-related performance for many more years to come.

The second limitation is in the manner that teacher respondents took part in a survey. In this study, the author distributed the survey to teachers via e-mail. Although this format delivers a higher and faster response rate than traditional methods, more research is needed to examine the reliability and validity of this approach.

Chapter II

REVIEW OF THE LITERATURE

What is critical thinking? This question is deceptive in its apparent simplicity. In our everyday lives, we treat critical thinking as a primitive concept, that is, society knows how to be critical, and society is confident that it knows what it means. However, when asked to write a definition, it becomes a difficult task to translate our understanding into a definition that can easily be communicated to someone else. Better stated, Dewey (1933, as cited in Angeli, 1997) remarks that "no words are oftener on our lips than thinking and thought. So profuse and varied, indeed, is our use of these words that it is not easy to define just what we mean by them" (p. 3).

When did the concept of critical thinking begin? The etymology of critical thinking goes back to the Greek word for critic, *Kritike*, the art of judgment. Critical thinking, building on the work of early philosopher Socrates, surfaced in society around 600 BC. According to Carson (1997), Socrates set the agenda for the tradition of critical thinking by "reflectively questioning common beliefs and explanations, and carefully distinguishing those beliefs that are reasonable and logical" (p. 1).

Furthermore, Socrates and those who followed his teachings, namely Plato and Aristotle, believed "only the trained mind is prepared to see beneath the deceptive appearances to the deeper realities of life" (Carson, 1997, p. 2). Critical thinking from the beginning included not only examination of the words and actions of others but also the examination of one's own thoughts and actions.

In the 20th century, our understanding of the power and nature of critical thinking has emerged in increasingly more explicit explanations. Continuing the work of Socrates,

Plato, and Aristotle, Angeli (1997) believes the writings of Sumner (1906), Dewey (1933), and Ennis (1962) are responsible for first bringing acclaim to critical thinking in education.

According to Rassi (2001), in 1906, William Graham Sumner published a land-breaking study of the foundations of sociology and anthropology, Folkways, in which he documented the tendency of the human mind to think sociocentrically and the parallel tendency for schools to serve the uncritical function of social indoctrination.

Sumner (1906) stated the following:

Schools make persons all on one pattern, orthodoxy. School education, unless it is regulated by the best knowledge and good sense, will produce men and women who are all of one pattern; as if turned in a lathe...orthodoxy is produced in regard to all the great doctrines of life. It consists of the most worn and commonplace opinions, which are common in the masses. The popular opinions always contain broad fallacies, half-truths, and glib generalizations. (p. 630)

However, it was not until Ennis's 1962 article, "A concept of critical thinking" that Americans gained interest in critical thinking. Ennis believed that "children need to be able to reason, to be open minded, to see different points of view and make decisions based on an evaluation of evidence" (p. 86).

Although numerous 20th century researchers have approached critical thinking concepts, a consensus of a definition has never been reached. In an analysis of these conceptualizations, notice that the key differences in the definitions is the focus of the quality of critical thinking, not the process of critical thinking. For example, Watson and Glaser in 1939 (as cited in Angeli, 1997), defined critical thinking "as the attitude and

skill to systematically and logically examine evidence supporting conclusions, examine the reasoning linking evidence to conclusions, and to produce statements supported by sound evidence and reasoning" (p. 5). Later researchers, such as Ennis (1962), agree with Watson and Glaser offering a simpler definition of "critical thinking as the correct assessment of statements" (p. 89). Thus, Watson, Glaser, and Ennis focused their definition on the result of information that has undergone assessment and judgement.

However, almost 20 years later, as researchers increased their sense of the pragmatic basis of human thought, Ennis (1989) takes a new approach in redefining critical thinking as a three-step process. First, Ennis states that thinking critically starts as a problem-solving process in a context of interacting with the world and other people. Second, it is a reasoning process, informed by background knowledge, and previously acceptable conclusions, and it results in drawing a number of inferences through induction, deduction, and value of judging. Third, the critical thinking process ends in a decision about what to do or believe.

Beyer (1985) believes in a similar process to that of Ennis. Beyer has defined critical thinking as the process of determining the authenticity, accuracy, and worth of information or knowledge claims. Beyer's theory includes six elements: (a) Dispositions (skepticism, questioning the accuracy, authenticity, plausibility, or sufficiency of information presented); (b) Criteria (conditions that must be met); (c) Argument (proposition, evidence, or reasoning that connects the assertion); (d) Reasoning (inductive and deductive inferences); (e) Point of view (one's perception); and (f) Procedures for applying criteria and judgment (questioning to clarify information, to discover assumptions, distinguish facts from fiction, and detect flaws in reasoning).

Finally, like Ennis (1989) and Beyer (1985) the National Council for Excellence in Critical Thinking (NCECT) (1996, as cited in Angeli, 1999), at California's Sonoma State University also defines critical thinking "as an intellectually disciplined process which is actively and skillfully conceptualizing, applying, analyzing, synthesizing, or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to a belief and action" (p. 7).

The Evolution of Critical Thinking Research in Education

Some researchers believe that the recent emphasis to define critical thinking got its impetus from the Nation at Risk, a prominent 1983 report on American education, from the National Commission on Excellence in Education. At about that time articles and books began to appear in the professional and popular press calling for teaching students to think, not just learn (Marsh II, 1999).

Since 1983, the critical thinking educational focus has been strongly supported in political sectors. In the 1980s then-Governor Bill Clinton of Arkansas led the way by incorporating critical thinking in the National Governors' Association's recommendation for national educational goals. In 1990, then-President George Bush's administration adopted National Goals 2000, including critical thinking in education (Duldt, 1997, p. 2).

Today, within the technological revolution, critical thinking skills have become a necessity. According to the Secretary's Commission on Achieving Necessary Skills (SCANS) (1991) there is a need to equip tomorrow's workers with information management, collaborative problem solving, and critical thinking skills. The chairman of the SCANS committee William Brock (as cited in Jones, 1996) states that "the most

effective way to educate our youth is to teach them in the context of real-life situations and real problems" (p. 5).

Many researchers agree with the SCANS report. For example, Alvarez (1997) believes that thinking and learning with technology strengthens the building of communities of thinkers. Similar beliefs are reported by Huff (2000) who stated "helping learners acquire a critically alert cast of mind—one that is skeptical of claims to final truths or ultimate solutions to problems, is open to alternatives, and acknowledges the contextually of knowledge in the quintessential educational process" (p. 403).

Traditional to 21st Century Classrooms

The transformation from traditional to 21st century classrooms may be the answer to success in the work force. In traditional classrooms, "the curriculum is held as absolute, and teachers are reticent to tamper with it even when students are clearly not understanding important concepts" (Brooks & Brooks, 1993, p. 6). On the other hand, 21st century classrooms "search for experiences that will foster the development of alternative and creative solutions to problems, and the development of clear, reasonable, meaningful, and thoughtful communication" (Leflore, Seaver, & Smith, 2000, p. 50).

The debate that has framed current educational conceptions was largely defined decades ago. Franklin Bobbit (1924, as cited in Angeli, 1999) wrote: "Education is primarily for adult life, not for child life. Its fundamental responsibility is to prepare for the 50 years of adulthood, not for the 20 years of childhood and youth" (p. 8). Other researches, such as Dewey (1938), argue that education as preparation for adult life denied the inherent ebullience and curiosity children brought with them to school, and

removed the focus from students' present interests and abilities to some more abstract notion of what they might wish to do in future years.

However, Brooks and Brooks (1993) believe that schools and the teachers within them can do both: "they can be student-centered and successfully prepare students for their adult years by understanding and honoring the dynamics of learning" (p. 57). Also, by recognizing that for students schooling must be a time of curiosity, exploration, and inquiry, and that memorizing information must be subordinated to learning how to find information to solve real problems.

Initial research evidence strongly supports this view. For example, in the fall of 1996, 33 sixth grade students in a social studies class in Northridge, California were randomly divided into two groups, one taught in a traditional classroom and the other taught using the Internet. The teaching model was not changed fundamentally, as texts, lectures, and exams were standardized across the two groups. Despite this, the Internet-based class scored, on average, 20 percent higher. Students in the Internet class had more contact with one another and were more interested in the class work. They also felt that they understood the material better and that they had greater flexibility in how they learned (Tapscott, 1998, p. 141).

In addition, Professor Clare Benson (1993) provided a case study that exemplified the use of critical thinking in a 21st century classroom. In the study, classes of 10-year-olds were making sweets for the Diwali festival. During initial activities to examine a range of sweets, they classified them in different ways; groupings included those they liked/disliked; those made with chocolate/those without; those traditionally made in India/ those that were not. The children needed to plan out in a sequence the actions that

they needed to do to make the sweets. Throughout the activity they were understanding themselves and others as they found out why Diwali sweets were important, and what the festival was about. The teachers' only role in this event was to provide appropriate contexts in which children can develop these thinking skills.

Through this example, teachers witness that "experiences, direct rather than vicarious, are vital to the critical thinking process, and that, for children, only through such experiences and the struggle with discrepancies, oddities, and anomalies does understanding occur" (Leflore, Seaver, & Smith, 2000, p. 55). Furthermore, Papert (1996, as cited in Tapscott, 1998) stated, "The scandal of education is that every time you teach something, you deprive a child of the pleasure and benefit of discovery" (p. 143).

Referring back to this case study, perhaps students searching the Internet to find information about the Diwali Festival found a Web Site that listed the wrong ingredients to make the sweets. Without critical thinking skills, the students most likely would have provided misrepresented sweets.

When teachers recognize and honor the human impulse to construct new understandings, unlimited possibilities are created for students. Brooks and Brooks (1993) believe that the educational settings that encourage the active construction of meaning have several characteristics:

First, they free students from the dreariness of fact-driven curriculums and allow them to focus on large ideas. Second, they place in students' hands the exhilarating power to follow trails of interest, to make connections, to reformulate ideas, and to reach unique conclusions. Third, they share with students the important message that the world is a complex place in which multiple perspectives exist and truth is often a matter of interpretation. Finally, they acknowledge that learning, and the process of assessing learning, are, at best, elusive and messy endeavors that are not easily managed. (p. 15)

Critical Thinking in the Age of the Technological Revolution

Included in the 21st century classroom, are ruses, falsehoods, and rumors, prevalent throughout classroom technology, such as the Internet. According to Fitzgerald (1997) there are many different types of misinformation on the Internet. This misinformation includes: incomplete information, pranks, contradictions, out-of-date information, improperly translated data, software incompatibilities, unauthorized revisions, factual errors, biased information and scholarly misconduct.

However many researchers have found that students are not evaluating Web pages for misinformation. Roth (1999) states that "seeking instant gratification, students can be indiscriminate and uncritical in evaluating information. Overwhelmed by the sheer number of possible sources available on the Internet, they find it difficult to determine the authenticity and quality of various sources" (p. 43). Alvarez (1997) agrees with Roth (1999) stating that "students who are given opportunities to investigate areas that make

use of a variety of instructional strategies and learning environment are constrained by time, content, and tradition" (p. 69).

Huff (2000) believes that there is another reason why students are not thinking critically. Huff contends that certain attributes contribute to one's predisposition to use critical thinking skills. These factors include open-mindedness, inquisitiveness, cognitive maturity, truth seeking, analyticity, and critical thinking confidence.

Pedretti (1999) argues this point one step further stating that children lack the cognitive competence to engage in decision-making values and education. Not only do students lack the cognizance, but also they have never been allowed to develop their critical thinking skills. McBrien's (1999) theory is that schools in the United States have traditionally taken a protectivist approach to media, and many parents have approved this approach. That is, if we don't let them surf the net, they will not be influenced by ill information on the Web. "Unfortunately, they receive these messages without having the skills to analyze them and arrive at an educational opinion. The student who is safest from unsavory messages is the student who is educated about them and can assess and evaluate messages for him or herself" (McBrien, 1999, p. 77).

It is even more important that students are allowed to evaluate messages. Adherence to the First Amendment prevents librarians or information service providers from separating information from misinformation for the patron. Only the user, who holds a unique concept of the nature of truth, may do this for him or herself. Therefore, the Internet user must be equipped with critical thinking tools to distinguish good information from bad information, insofar as this is possible (Fitzgerald, 1997, p. 10).

What Huff (2000), Fitzgerald (1997), Alvarez (1997) and Roth (1999) do agree with is that neither critical-thinking skills nor information – seeking skills are learned automatically. Teachers must provide opportunities for practice within the classroom.

How to Evaluate Information

One question that arises from the debate is whether or not critical thinking should be taught as a general skills course or situated in a context. At this point, there are no empirical studies in critical thinking to answer the question, even though critical thinking increasingly becomes a major focus of mission statements in educational as well as corporate settings (Angeli, 1997).

However, many researchers have developed several steps that educators should teach students in order to evaluate the information on the Internet. Fitzgerald (1997) has exhibited a nine step process which includes: (a) Adopt critical consciousness for all information evaluation; (b) Establish prior knowledge through wide browsing, searching, and reading; (c) Distinguish between fact and fiction; (d) Evaluate arguments; (e) Compare and contrast related pieces of information from different sites, sources, and search engines; (f) Evaluate the reliability of online sources; (g) Identify and detect bias; (h) Learn to interpret the conventions of the Internet; and (i) Examine assumptions.

There have also been attempts from the media to become involved in teaching critical thinking skills. According to McBrien (1999), in 1998, executives at Turner Learning and South-Western Educational Publishing met to discuss student and teacher needs in the area of critical thinking skills. The resulting curriculum is a multiple-media package for high school students titled Media Matters: Critical Thinking in the

Information Age. The module contains an active-learning student workbook, a teacher's guide, accompanying video and audio clips, supplementary materials on computer disks, and a Web site.

Conclusion

Most researchers agree that not only is the amount of information increasing, but also the rate of increase itself is increasing. Thus, those who seek knowledge for various purposes need to expand their critical thinking skills. In the words of John Chafee (as cited in Facione, 1990), "Critical thinking is my life, it's my philosophy of life. Its how I define myself...I'm an educator because I think these ideas have meaning. I'm convinced that what we believe in has to be able to stand the test of evaluation" (p. 2).

In addition, educators must remember that critical thinking goes way beyond the classroom. "These skills came before schooling was ever invented; it lies at the roots of civilization. It is the corner stone in the journey human kind is taking from beast-like savagery to global sensitivity" (Facione, 1990, p. 14).

This sensitivity is imperative in the entrepreneurial process. Mescon and Mescon (1997) believe that being able to think critically will provide a significant competitive advantage. For example, the Mars family recognized that the probability of introducing a new best selling candy bar was less than likely. So, with much incremental motivation, they launched a national campaign to select a new color for M&M's candies.

Weinstein, (1991) agrees with Mescon and Mescon (1997) stating, "different points of view, whether diverse disciplinary lenses, differing social points of view, or alternative value stances reflect divergent aspects of complex problems or understandings. And so,

what is needed is flexibility of thought-the ability to synthesize deeply different frames of reference, to think across differing perspectives, and to weigh competing values" (p. 2).

An example of Weinstein's point is that of Bill Gates, founder of Microsoft. Bill Gates only approached Funk & Wagnalls to collaborate on an encyclopedia CD-ROM after being turned down by a haughty Encyclopedia Britannica. This CD-ROM was designed for a new generation of interactive-loving users. Microsoft and Funk & Wagnalls' Encarta is now the leading encyclopedia in the multimedia market, whereas Britannica is up for sale.

It is no wonder that business and civic leaders are concerned about critical thinking skills. "Critical thinking, an informed and thoughtful citizenry, is a necessary condition for the success of democratic institutions and free market economic systems. This value is, in fact, so important that it could be argued that it is in the national interest that we should try to educate all citizens so they can learn to think critically. Not just for their good, but the good of the rest of us" (Facione, 1990, p.11).

Chapter III

EFFECTS OF THE INTERNET

The impact of the Internet in our schools has had profound effects. With access to vast quantities of information, a wealth of learning possibilities has emerged. Pictures, sound, music, and text offer children with different styles and strengths multiple paths to the same information. This vast amount of information can be an important learning tool for teaching critical thinking skills such as problem-solving and interdisciplinary investigations (Druin & Solomon, 1996).

However, if the process of incorporating the Internet into a classroom's environment is not developed by taking into consideration the best approach of teaching and learning, teachers can not expect students to develop these important critical thinking skills. In other words, how a learning environment is designed is one of the most influential factors on the impact the Internet has on teaching children.

The effects of a poorly developed classroom environment can occur immediately or over the long term. Immediate effects are those that happen a few days or weeks after using classroom technology. Long-term effects are those that begin to show up only after an accumulation of usage over months or years. Table 1 illustrates the risks listed most by a panel of experts who have presented research on this topic.

Table 1

Overview of Effects

TYPE	IMMEDIATE	LONG TERM
Physical	Temporary... a. Eyestrain b. Repetitive Stress Injuries (RSI) c. Obesity	Damage of the eye Physical Impairments from RSI's
Emotional	Isolation	Social Anxiety Disorders Acquiring Social Norms
Behavioral	Lack of Motivation	Constant Reinforcement

This panel of outspoken critics, called The Alliance for Childhood, cautions that there are both immediate and long-term developmental risks for children using technology in schools. In the report, Fool's Gold (2000), The Alliance for childhood, an international group of educators, physicians, and others, believe that computers pose serious risks that include "repetitive stress injuries, eyestrain, obesity, social isolation, and for some, long-term physical, emotional, or behavioral developmental damage" (p. 3).

Other critics, such as Armstrong and Casement (2000), in their book The Child and the Machine, and Stoll (1999) in his book High-Tech Heretic, focus on the issue of long-term effects of computer use in the classroom. Both researchers believe that computers contribute to a wide-range of physical disorders that will effect our children's future in the workplace.

Armstrong and Casement (2000) state that the most prevalent injuries suffered by all computer users are musculoskeletal ailments that fall within the broad category of

repetitive strain injury (RSI). The tendons, tendon sheaths, muscles, ligaments, joints, and nerves on the hand arm, neck, and shoulder can be strained by repetitive movements such as those involved in keyboarding or clicking on a mouse. The Cornell Ergonomics Web site (2000) points out that since the average American child is currently spending 1 to 3 hours daily in front of a computer, there is a great potential for injury. Injuries in their milder forms can include discomfort, tenderness to touch, inflammation, and weakening of the tendons. The more serious injuries can lead to pain, numbness, tingling, and loss of sensation.

The Alliance for Childhood (2000) also believes that computer use places added strain on a child's eyes and developing visual system, and may actually make learning to read more of a challenge for young children. According to the Cornell Ergonomics Web site (2000), looking at a computer screen for long periods may cause some changes in how the eye works, causing computer users to blink less often, and exposing more of the eye surface to the air.

Children at risk from using visual display terminals (VDTs) often complain of fatigue, eyestrain, burning, tearing, soreness, blurred vision, and headaches. These injuries can occur because grade-school children are still developing their muscular and nervous systems. The Alliance for Childhood (1999) found that it's not until about the age 11 or 12 that their capacity to balance and coordinate the movement and the focusing of both eyes together is fully mature. Furthermore, Dr. Edward C. Godnig (2000), a behavioral optometrist warns "that intense computer use without proper breaks may delay the completion of that maturation into adulthood" (p. 23).

In recent years, ergonomic issues in the workplace have become a well-recognized problem. According to the Seattle Times (1999), repetitive stress injuries are an epidemic among American adults – between 13 million to 20 million are affected, according to the National Academy of Sciences. In addition, the American Occupational Health and Safety Association (as cited in Armstrong & Casement, 2000) states that “RSIs cost U.S. businesses \$20 billion in 1993 alone. As researched by the Worker’s Compensation Monitor, the average claim for RSIs cost \$11,479 in 1997” (p. 150).

However, little concern has been raised regarding ergonomics in the classroom. For example, in an article from the Cornell Web site, three Cornell professors’ state that in 1996, Microsoft and Toshiba began a Laptop Pilot Program at 52 schools across the United States. The pilot program was designed to demonstrate that providing every student within a classroom with access to real world business tools would produce substantial educational benefits. However, they never considered ergonomic issues.

There are several “un-ergonomic” laptop issues. First, there is the fact that a pointing device on a laptop is almost always located in the middle and may not allow a student to keep arms at a neutral position. Alan Hedge (2000), professor of ergonomics and director of the Human Factors and Ergonomics Laboratory at Cornell University, reports that computer users should consider purchasing a mouse or any other external-pointing device. Further, if a student uses a laptop for more than one hour at a time, it is wise to obtain an external keyboard and/or monitor to avoid RSIs. Toshiba or Microsoft provided neither a mouse nor external keyboard. Finally, in a 1998 study of 314 children aged 10 to 17, Harris and Straker (2000) found that 61 percent of students reported discomfort in just carrying their laptops.

The Alliance for Childhood (2000) poses the question that asks, "who will take financial responsibility for the care of children who do suffer injuries" (p. 22). There are millions of poor children whose parents do not have health insurance. In addition, families without health insurance may be more likely to delay seeking treatment for health problems that do not seem serious. In an article written in the Seattle Business Times (Fisher, 1999), physicians, physical therapists, and chiropractors report that the patients complaining of back, neck, and wrist pain are getting younger by the day. There are also many college health clinics reporting high numbers of students complaining of computer-related pain. In Fool's Gold, The Alliance for Childhood (2000) states, "At M.I.T., about 175 students a year seek treatment for computer-related injuries. A few are so injured they have to change their career plans" (p. 23).

The Cornell University ergonomic researcher team believes that as professionals, we believe it is our responsibility to protect future generations against known injury risks, and to ensure that our children acquire good lifelong skills based on sound ergonomic practices. (Hedge, 2000, p. 16)

Cornell University has put together an online newsletter that gives ergonomic guidelines that should be developed within all classrooms. These guidelines fall under the categories of furniture and equipment, normal work area, and computer monitor position. Based on these guidelines, Cornell researchers visited children in grades three, four, and five at 11 elementary schools. According to the Alliance for Childhood (2000), keyboards were set too high for the children using them, and the computer monitors were also too high in most cases. The researchers concluded that at least 40 percent of the children were at risk of serious injury.

In addition, the Curtin University of Technology in Australia, has been the first and only to investigate the use of laptop computers by children in schools. A study found that 60% of students reported discomfort in using their laptops. The researchers concluded "school children are exposing themselves to prolonged poor postures with laptop use that is leading to discomfort. This is of particular concern as it occurs during critical periods of their skeletal growth" (Harris & Straker, 2000, p. 13).

However, Joanne Jacobs a columnist for the San Jose Mercury News completely disagrees with the Alliance for Childhood researchers. Jacobs (2000) states, "I think Fool's Gold exaggerates the risks of computers, especially in schools. No school gives students enough time to put them at risk of repetitive stress injuries, eyestrain, obesity or nerdiness, much less long-term physical, emotional and intellectual damage" (p. 1).

In a feature on the risks of computer use in the classroom, principals in New Jersey were interviewed on their thoughts regarding Fool's Gold. Principal Donohue and Principal O'Connor, supported the thinking of Jacobs (2000) and in fact, Donohue stated that kindergartners click on the computer for only 20 minutes a week in class. O'Connor included that his children spend only about 90 minutes a week on interactive software.

However, as educators debate the physical effects of classroom technology, other researchers, such as Peter Goodyear (1996) propose that teachers should restructure their entire design and management of the learning environment. In other words, "you have to stop trying to improve the functioning of the old system. Instead lay down the seeds for something new" (Papert, 1980, p. 27).

According to Mike Kennedy (2000), author of the article "Connected and Comfortable", today's generation of students' work together in small groups as a teacher

roams the room to monitor progress or lend a hand. Furthermore, in Kennedy's interview with Doug Snyder, superintendent of the Issaquah (WA) school district, Synder states, "having the desks in straight lines is not the way things are done anymore. We need to have flexibility" (p. 35). This flexibility will include new furniture and workstations that allow students to move out of the industrial age into a learning environment that supports an information society.

Researchers such as Floyd (1991) state that in the past, teachers were primarily deliverers of information; they presented the curriculum and graded the achievement of students. Today, teachers need to be the analysts and facilitators of learning, and they are expected to assist all students to achieve specified objectives. Donald Leu (2000) of Syracuse University finds that many nations around the world are responding to a new world centered on information and communication. Countries such as Finland, Ireland, and Australia are designing new curriculums to prepare children for a global information society. However, in the United States, a national curriculum is less likely due to a long history of local school control and the partisan political nature of this question.

Floyd (1991) also believes that educators are aware that children live in a new age and that the thrust of education should be changed, but continue to teach within a limited repertoire of pedagogical alternatives that emphasize teacher talk and the monitoring of seatwork. In order for reform to succeed, classrooms must reflect an awareness of changing values; schools must be cognizant of the principles of an information society.

On the other hand, the Alliance of Childhood (2000) concludes that revamping the educational system will cause children to form inappropriate social behavior. These immediate effects include isolation leading to a lack of motivation to learn. A recent

study in the U.S News and World Report (Kelly, 1999) estimated that children between the ages of 10 and 17 today will experience nearly one-third fewer face-to face encounters with other people throughout their lifetimes as a result of their increasingly electronic culture, at home and school.

In addition, the Alliance (2000) noted a recent study by the American Association of University Women Educational Foundation. The foundation challenges the notion that computers routinely motivate classroom learning. Computers, it found, bore many girls. And many boys seem more interested in violent video games than educational software.

However, proponents of restructuring our schools believe that a simple solution to avoiding inappropriate behavior is to incorporate small-group learning. Small-group instruction can provide the fresh view needed to restructure classroom design and to enhance the teaching and learning processes in the information age.

Floyd (1991) states that a well-established and proven principle of social psychology is that people working together toward common and established goals can achieve more than working by themselves. Furthermore, Chin and Salisbury (1999) have noted that the notions of teams and teamwork have received considerable attention by researchers in the past decade. With greater global competition and improving technology, firms are increasingly relying on teams, virtual or otherwise, to accomplish organizational objectives. As a result, developing work-team environments in schools is critical.

According to David Wizer (1995) of Johns Hopkins University in Maryland, there are practical reasons why educators might want to consider combining classroom technology with small group learning methods. First, based on a survey of computer-

using teachers, a majority of classrooms have fewer than two computers. Grouping students at the computer could enhance computer access. Second, small group learning has become a common method of instruction in classroom settings because it has shown to relate positively with student achievement.

Wizer (1995) studied 48 middle school students working in dyads on mathematical word problems. The group behaviors investigated were verbal and nonverbal behaviors that occurred when students worked at computers. The verbal behaviors included asking questions, giving agreements, giving answers, giving disagreements, giving explanations, receiving agreements, receiving answers, receiving disagreements, receiving explanations, and receiving questions. The nonverbal behaviors studied were referred to as keyboard entries per minute and mutual keyboard usage. The results of this study indicated that two interpersonal behavior variables were significantly related to achievement: mutual keyboard usage and giving explanations.

First, Wizer (1995) found that the positive relationship between mutual keyboard usage and achievement represents on-task behavior by both partners because both partners participate in answering the questions. Second, the study found that students working in small groups were more likely to share explanations for their answers. Explanations are believed to signify a higher level of cognitive processing, which can benefit the student giving the explanation. For that reason, Wizer suggests that teachers encourage these types of verbal exchanges.

Other researchers such as Floyd (1991) agree with Wizer's (1995) conclusions. Floyd believes that small group learning experiences, compared with competitive and individualistic ones, promote higher achievement, greater motivation, and more positive

attitudes toward the subject matter and the teacher. In addition, using small-group instruction in classrooms will help teachers with many interactions and complex decisions they face every day. Students will have higher self-esteem, higher rates of positive social behavior, and higher academic achievement.

Just take a situation in every day work life as an example. A group of product managers collaborate to analyze the best solution for selling their company's product. The members of an effective team do not compete with each other; they work in concert, like colleagues for the common goal. Unless they solve the problem, none of them has won.

According to Tapscott (1998), "Learning is social. Most understanding is socially constructed. Through conversation and dialogue, children come to their own understandings of an experience. This is true for adults as well. Therefore, most learning within organizations tends to occur in teams" (p. 137).

There are still many more possibilities to be discovered by learning more about the ergonomics of learning environments. One of the early pioneers of Artificial Intelligence, Seymour Papert (1980), has stated,

Technology is obsoleting the model of a learning environment in which teachers-who-know hand out knowledge to students-who-know-not. Instead it demonstrates a model in which younger people and older people are able to give one another the kinds of knowledge that each happens to have. A model in which the old teacher/student relationship is replaced by learning together. (p. 38)

However, according to Goodyear (1996), no matter how educators attend to the ergonomics of the learning environment, "they must ensure that they take a student-

centered and systemic approach to the design of educational technology: one which is grounded in real world activity and which stands a chance of producing tools which make a difference to student's working lives" (p. 78).

Chapter IV

METHODOLOGY

Introduction

Considering that 95% of the nation's public schools are connected to the Internet, this evaluation set out to address the question of how computers are used in a select group of fifth through ninth grade classrooms for learning. Hopkins (1998) believes that students in the age group of 9 to 14 -year-olds were studied, because they are eager to learn and still impressionable.

An important component of this study is the assessment of the computers' impact on student development for the workplace, including group work, physical impairments, and critical thinking skills. The research strategy chosen was to collect data from teachers and students using two questionnaires. The questionnaires would provide an opportunity to compare and contrast information objectively, and ascertain if a difference existed between teachers and students in the perception of how technology is used in the classroom. This methodology chapter will communicate how these data were collected for this research project and to describe the methods applied to analyzing these data.

Sample and Population

Three steps were taken in targeting the teacher sample for this study. First, US American Online (AOL) user profiles' were searched in 22 states. These states included the Northeast and Southwest regions of the United States. Next, on February 6, 2001, the subjects of each profile, who listed their occupation as a teacher, received an e-mail

message introducing the author and the purpose of the study (see Appendix C). Finally, the e-mail invited the subjects to click on a provided URL address in order to access the author's anonymous survey through an e-Research company called Zoomerang.

Once the respondent clicked on the URL, an introduction to the survey on Zoomerang's Web Site would come into view on the screen. Like the original e-mail message, the introduction stated the purpose of the study, while also providing directions to completing 10 questions, and welcoming respondents to add any opinions or suggestions they may have at the end of the survey. To begin, respondents were instructed to click on a button labeled "start survey". Each question was set up on a 5-point Likert scale based on frequency of occurrence (Always, Often, Sometimes, Rarely, and Never). In order to answer each question, respondents were instructed to rate each question (1-5) by clicking with their mouse on the most appropriate answer. In addition, respondents were also able to type comments and suggestions following question seven. Once finished, respondents clicked on a button labeled "submit".

The last completed survey was submitted on February 9, 2001. Out of 252 e-mailed requests, 173 classroom teachers of kindergarten through 12th grade replied. Of the 173 respondents, teachers of fifth through ninth grades completed 111 surveys. The author analyzed these 111 questionnaires. Those that had a high number of zero's (not experienced) or incomplete responses were eliminated. In addition, open-ended suggestions and comments were evaluated for relevancy. In all, 18 surveys were eliminated leaving 93 for evaluation. Out of the 93 surveys evaluated, 24 teach fifth grade, 19 teach sixth grade, 14 teach seventh grade, 25 teach eighth grade, and 11 teach ninth grade.

The second survey developed was for students. Out of a nationwide population of 15,360 school districts, the sample surveyed consisted of three schools of the East Orange School District that are partners with the Apple Learning Interchange program (ALI). The ALI is an online community for educators. This community is a place where educators can go to find resources and lessons, share ideas, participate in online events, and get the latest on education news.

This sample had been deliberately non-randomly selected because it represents districts thought likely to be further along the road toward the usage of technology for learning and therefore more likely to have identified the issues addressed in chapters II and III of the author's review of the literature.

A talent search counselor of Seton Hall University's Educational Opportunity Program (EOP) passed out the author's survey. Students of the EOP have the ability to do college work, but might not otherwise be accepted through regular college admissions procedures, and are dependent on financial aid to obtain a college education.

Students of the EOP program were chosen for this study because they had been offered extra counseling, tutoring, and academic advisement in all classes in order to prepare for future academic and professional environments.

The survey instrument was constructed so that each respondent could circle the answer to each question that corresponds to the frequency of occurrence of the classroom activity. Once again, the questionnaire was set up on a 5-point Likert scale (Always, Often, Sometimes, Rarely, and Never).

The author requested that the talent search counselor pass out the surveys in accord with the following three steps: On February 13, 2001, the counselor located EOP

students in classrooms, regardless of the subject material, that used technology for educating students. Next, the counselor read an instruction sheet on how to fill out the survey (See Appendix D). Finally, the counselor collected the surveys and submitted them in an envelope directly to the author.

Thirty-three students participated in the entire study. Of the students who participated in the study, 73% were girls. The distribution of students who participated by grades were 9% from the fifth grade, 12% from the sixth grade, 25% from the seventh grade, 24% from the eighth grade, and 30% from the ninth grade.

Copies of complete surveys are offered as Appendix A and B. Each questionnaire included common questions such as background and demographic information. The majority of questions were identical on both surveys, but some questions were modified given the different audiences.

Data Collection

In order to tabulate the results, Zoomerang's database software program was used to create an identical electronic version of the student survey on the World Wide Web. Each pen and paper survey's answers were inputted individually into the database. Zoomerang's service allowed the author to analyze the critical feedback necessary in reporting important results.

Zoomerang is a division of MarketTools, the global dominant ASP for eResearch and eFeedback. The company provides advanced Web-hosted technology and advisory services to help companies or individuals conduct research. The (www.zommerang.com) states that it "provides this service through patent-pending technology and professionally-designed templates. The results are captured and presented in graphically-

rich formats in real-time - which allow users to measure incoming responses and act on the findings very quickly" (on-line).

Zoomerang was chosen to deploy and tabulate the teacher survey and tabulate the student survey for the following reasons: First, the results were displayed using statistical computations. Second, the author had the opportunity to cross-reference two different responses from the surveys. Finally, the electronic format allowed data to be analyzed more accurately than traditional methods.

Chapter V

RESULTS

Given that technology has been shown to be a useful form of learning, and such educational tools are called for because of social changes for which students must be prepared, the question becomes one of how technology might be successfully used to prepare the nation's students for the workplace. The questions for this research study are the following: First, how do educators perceive technology should be used in the classroom, and second, how are students actually utilizing these educational tools?

The alternative hypothesis is that variables exist in the teaching methods of educators, which influence the degree of student preparation for the workplace. These independent variables include critical thinking and evaluation skills, teamwork skills, and ergonomic safety while using classroom computers. The null hypothesis is that no variables would be found to exist which influence the degree of preparation of students for the workplace.

The dependent variable is the degree to which students and teachers use technology for learning in fifth through ninth grade classes. Regarding this dependent variable, each measure was analyzed by the response to the items on the survey. The analyses of the survey responses for both students and teachers have the following results:

Presented here is an analysis of how often teachers at school use computers while teaching class. As may be seen in Table 2, a little over half of the East Orange School District reported that their teachers often use computers, while 42% reported that their teachers sometimes use computers. In comparison, a little over half of teachers said that

they often use computers, while 32% responded that they sometimes use the computer. None of the teachers or students reported that educators never use computers for class.

In addition, students were also asked to rate how often they use the Internet for questions and assignments during class. According to Table 3, the majority of students stated that they use the computer for questions and assignments either sometimes, often or always. Only 18% rarely used this tool and 3% never worked on assignments in class. Teachers reported similar results. Only 10% rarely assigned classroom work during class, while 7% never assigned classroom work at all.

Table 2

Frequency of Teachers Using Computers While Teaching

	Number Of Student Respondents	Percentage Of Student Respondents	Number Of Teacher Respondents	Percentage Of Teacher Respondents
Always	1	3%	7	8%
Often	17	52%	54	57%
Sometimes	14	42%	28	30%
Rarely	1	3%	4	5%
Never	0	0%	0	0%

Table 3

Frequency of Students Using Computers for Classroom Assignments

	Number Of Student Respondents	Percentage Of Student Respondents	Number Of Teacher Respondents	Percentage Of Teacher Respondents
Always	3	9%	29	31%
Often	8	24%	17	18%
Sometimes	15	45%	32	34%
Rarely	6	18%	9	10%
Never	1	3%	6	7%

Next, the author will turn to the analysis of conditions that influence this factor. Recalling that the review of the literature stated that the necessary conditions for successful workers include those who have been trained to think critically, know how to work in groups, and those who are less likely to be exposed to ergonomically unsafe situations, the responses from the students and teachers have been analyzed to ascertain whether or not the students are being prepared to be apart of the workforce.

First, the author chose to address issues concerning critical thinking skills. Quality professional development is critical to teacher effectiveness in helping students become better learners. However, this study found that students were not receiving critical thinking skills. Out of 33 student respondents, only 15% stated that their teachers always taught them how to evaluate information from the Internet. On the other hand, 24% said

that their teachers never taught these critical thinking skills. Interestingly, as Table 4 shows, 6% of teachers reported always teaching students how to evaluate information, while 45% reported rarely teaching critical thinking skills.

The amount of exposure to critical thinking skills is then compared to the results of student classroom assignments. With 45% of teacher respondents not teaching these skills, 69% of teachers said that their students sometimes, often, or always turn in classwork with incorrect information. Table 5 exhibits the reason why assignments are given to teachers incorrectly. First, 48% of student respondents stated that they always or often use the first Web Site found on an assigned subject. In addition, 54% of students reported that they rarely or never verify information found on a Web Site. Finally, 70% of students rarely or never check if the author of a Web Site is credible or factual.

Table 4

Frequency of Evaluation of the Internet

	Number Of Student Respondents	Percentage Of Students Respondents	Number Of Teacher Respondents	Percentage Of Teacher Respondents
Always	5	15%	6	6%
Often	2	6%	16	17%
Sometimes	7	21%	22	24%
Rarely	12	35%	41	44%
Never	8	24%	8	9%

Table 5

Frequency of Using Critical Thinking Skills in Classroom Assignments

Skills	Percentage Of Respondents Who choose "always"	Percentage Of Respondents Who choose "often"	Percentage Of Respondents Who choose "sometimes"	Percentage Of Respondents Who choose "rarely"	Percentage Of Respondents Who choose "never"
Teachers who stated "I collect incorrect assignments"	3% (3)	13% (13)	56% (51)	21% (19)	7% (7)
Students who stated "I provide info from the first Web Site I find"	24% (8)	24% (8)	45% (15)	3% (1)	3% (1)
Students who stated "I verify information"	3% (1)	21% (7)	21% (7)	39% (13)	15% (5)
Students who stated "I check if the author is factual or credible"	0% (0)	12% (4)	18% (6)	49% (16)	21% (7)

The author also addressed ergonomic safety issues (see Table 6). Respondents were asked to rate how often students feel discomfort or pain while using the computer in school. Students reported that they feel pain sometimes 41% of the time. Meanwhile,

47% stated that they never feel pain while using the computer at school. Again, teachers responded similarly with 43% reporting that their students sometimes complain of pain and 45% stating that their students never complain of pain.

As indicated in Table 7, of the 53% of students who have felt pain or discomfort, 52% stated they feel pain in their neck, 45% stated they feel pain in their eyes, 27% stated they receive headaches, 30% stated they feel pain in their fingers, 12% stated they feel pain in their back, and 9% stated they feel pain in their thighs. On the other hand, of the 57% of teachers who have had complaints from students reporting pain or discomfort from in class computer use, 53% reported eyestrain complaints, 30% reported headache complaints, 27% reported finger pain complaints, 10% reported neck pain complaints, and 10% reported back aches.

Table 6

Frequency of Discomfort or Pain

	Number Of Student Respondents	Percentage Of Students Respondents	Number Of Teacher Respondents	Percentage Of Teacher Respondents
Always	0	0%	1	1%
Often	1	3%	4	5%
Sometimes	14	41%	40	43%
Rarely	3	9%	6	6%
Never	16	47%	42	45%

Table 7

Location of Physical Pain

	Number Of Student Respondents	Percentage Of Students Respondents	Number Of Teacher Respondents	Percentage Of Teacher Respondents
Eyestrain	15	45%	49	53%
Neck pain	17	52%	9	10%
Finger pain	10	30%	25	27%
Head aches	10	30%	28	30%
Back aches	4	12%	9	10%
Leg aches	3	9%	0	0%

By asking respondents three questions, the author gained key insights into why students feel discomfort (see Table 8). First, when teachers were asked, "I teach my students how to properly sit at the computer", 55% reported rarely or never. When asked the same question, students stated that 70% of teachers rarely or never check to see if they are sitting properly at the computer. Second, the question, "When using the computer in class, I give breaks," 50% of all teachers stated that they sometimes, often, or always give breaks, and 50% rarely or never give breaks. Students responded in a similar manner with 54% experiencing breaks sometimes, often, or always. Finally, teachers were asked, "Before, during, or after computer use, the class will perform stretching

exercises. Here, 53% of respondents answered rarely or never. Again, students' answers were close to that of teachers with 58% reporting rarely or never being asked to stretch.

Table 8

Frequency of Ergonomic Safety Issues

Skills	Teachers Vs. Students	Percentage of Respondents Who choose "always"	Percentage of Respondents Who choose "often"	Percentage of Respondents Who choose "sometimes"	Percentage of Respondents Who choose "rarely"	Percentage of Respondents Who choose "never"
Students are taught to sit properly at the computer	Teachers	12%	14%	19%	38%	17%
	Students	15%	3%	12%	15%	55%
Students are given breaks in class	Teachers	1%	17%	32%	38%	12%
	Students	9%	21%	24%	24%	21%
Students perform stretching exercises	Teachers	4%	14%	29%	35%	18%
	Students	3%	9%	30%	33%	25%

Through an analysis of the data, of the 41% of teachers who have had students complain of discomfort, 42% had rarely or never instructed students on how to sit properly at the computer. The author believes that this figure suggests that monitoring his or her posture may lessen early childhood pain. In addition, learning how to sit properly may limit a child's chance of developing pain before entering the workforce.

Lastly, the author chose to examine the frequency of group work on the computer. According to Floyd (1991) "Active learning, the interaction that occurs between and

among participants, is the internal rearrangement of complex systems of attitudes, knowledge, feelings, skills, and perceptions (p. 90). Table 9 reveals that 47% of students never work in-groups. Likewise, 44% of teachers reported that their students never work in-groups.

Table 9

Frequency of Group Work

	Number Of Student Respondents	Percentage Of Student Respondents	Number Of Teacher Respondents	Percentage Of Teacher Respondents
Always	3	9%	2	2%
Often	1	3%	14	15%
Sometimes	13	39%	33	36%
Rarely	11	33%	2	2%
Never	5	15%	42	45%

In addition to the survey questions, the author analyzed one open-ended question that asked teachers for any questions or comments. Out of 93 respondents, 14 expressed an opinion at the end of the survey. All 14 were disgruntled about the ergonomic issues stated earlier. All believed that with 30 minute or 40 minute class periods, there is no need to take breaks or to stretch. As one respondent stated, "the whole class period they are jumping from computer to computer. It is not like they are sitting in one place for the whole period of time."

However, although some may disagree with the characteristics of this literature, the findings emerge consistently across both surveys. Therefore, the author can be confident those findings are accurate.

Chapter VI

CONCLUSION

Despite the many positive uses of Internet-based classwork, this body of research clearly shows there is a lack of 21st century teaching that may lead in the future to short-term and long-term negative effects. Primarily among these negative effects exist a limited amount of problem-solving skills, physical ailments, and a lack of social skills in a work place environment.

Now that the author has learned that select students are not being taught the necessary skills to succeed in the work force, classroom technology should be examined further. This examination is based on education as an industry undergoing a reengineering process as it refocuses on the needs of the student and the most effective ways to fulfill those needs. The use of technology as a means to accomplish these ends leads to the conclusion that: technology is a tool used to develop social and communications skills, making students effective as employees in a new economy. As Klinge (1974) states,

We are now undergoing a profound revolution-and it is carrying us in precisely the opposite direction. Instead of homogenized social system, with all of us reduced to sameness, the SuperIndustrial Revolution is creating a system based on fantastic variety, dazzling diversity, incredible differences and variations in tastes and styles, in religion, values, and politics. (p. 8)

Sturtevant (2001) presented recent data from New York State, one of the leading states in funding educational technology, suggesting that 72% of students and 50% of teachers now use computers regularly. However, as teachers use the computer more

often, the positivist notion that technology will solve human problems from the field of education should not be rendered. In addition, Sturtevant (2001) finds that the Aerospace Education Foundation sociologists and educators have observed that public schools are nonrewarding, that students are turned off by a series of failure experiences, that students feel the learning-environment is hostile and custodial rather than involving and challenging, and that teachers may fail to recognize the individual differences in students.

The challenge to 21st century learning is expected. Every communications medium in the 20th century has evolved over some period of time from an infant stage to a full adult stage of development. Almost all media have been revolutionary for their time. The telephone, radio, television, cable, satellites, and others all made profound changes in how Americans work, play and socialize. But a strong case can be made that no medium prior to the Internet has grown so quickly to touch the daily lives of so many people. The United States Internet Council (1999) has found that from 1992 until now, a year in development of the Internet has been likened to 5 to 10 years in the evolution of other media. The backbone of the Internet now doubles in capacity every one hundred days.

The need for change is clearly perceived. Committed business leaders and educators must develop shared visions, workable plans, relying on reengineered learning processes through the instructional use of technology. Once developed, this shared vision and workable plan, must be communicated widely and seen through to accomplishment. "The technology of tomorrow could be quite humane in its consequences if we are intelligent enough to bring into being, if we master technology and place it under some kind of democratic social control rather than just letting it happen" (Klinge, 1974, p. 14).

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Appendix A

Survey



Technology in the Classroom

1 Resources:

1 Always 2 Often 3 Sometimes 4 Rarely 5 Never

1. I use the computer to teach material to students.

1 2 3 4 5

2 Classwork:

1 Always 2 Often 3 Sometimes 4 Rarely 5 Never

1. My students use the computer to complete class assignments.

1 2 3 4 5

3 Issues Addressed:

1 Always 2 Often 3 Sometimes 4 Rarely 5 Never

1. I teach my students how to evaluate information on the Internet.

1 2 3 4 5

2. I teach my students how to properly sit at the computer.

1 2 3 4 5

3. The students work on classroom computers in groups.

1 2 3 4 5

4 Classwork:

1 Always 2 Often 3 Sometimes 4 Rarely 5 Never

1. After using the Internet, assignments completed in class have been turned in with incorrect information.

1 2 3 4 5 N/A

5

Computer Usage:

1 Always 2 Often 3 Sometimes 4 Rarely 5 Never

1. When using the computer in class, I give breaks.

1 2 3 4 5

2. Before, during, or after using the computer, the class will perform stretching exercises.

1 2 3 4 5

6

Physical Pain:

1 Always 2 Often 3 Sometimes 4 Rarely 5 Never

1. Students complain of physical pain from using classroom computers.

1 2 3 4 5

7

1. Students complain of physical pain from classroom computers in the following areas:

- ☐ eyes
- ☐ neck
- ☐ pain in fingers
- ☐ headaches
- ☐ pain in back
- ☐ pain in leg
- ☐ pain in foot
- ☐ pain in thighs
- ☐ my students do not complain of pain
- ☐ Other, Please Specify


8

Please select what grade you teach:

Please Select

9 For how long have you been teaching?

Please Select 

10  Do you have anything additional to add to this survey?



After answering all the questions, click the "submit"
arrow below to complete the survey.

SUBMIT 

Appendix B

Survey

SURVEY

Technology in the classroom

1. Please state your age: _____
2. Please state your sex (m/f): _____
3. Please state your grade: _____

Please rate each of the following on a 1-5 scale by circling the most appropriate answer. Where (1) is "Always," (2) is "Often," (3) is "Sometimes," (4) is "Rarely," and (5) is "Never".

4. The teachers at your school use computers while teaching class. = _____

1	2	3	4	5
Always	Often	Sometimes	Rarely	Never

5. I use information from the Internet for class questions and assignments. _____

1	2	3	4	5
Always	Often	Sometimes	Rarely	Never

6. When using the Internet to complete classroom assignments, I like to:

- a. Check if the author of a Web Site is credible or factual _____

1	2	3	4	5
Always	Often	Sometimes	Rarely	Never

- b. Use the first Web Site I find on the subject assigned _____

1	2	3	4	5
Always	Often	Sometimes	Rarely	Never

- c. Verify information by looking for the same information on another Web Site _____

1	2	3	4	5
Always	Often	Sometimes	Rarely	Never

7. My teacher has discussed with the students how to evaluate information found on the Internet. _____

1	2	3	4	5
Always	Often	Sometimes	Rarely	Never

8. Rate how you use the computer in school.

a. I work on the computer in a group during class _____

1	2	3	4	5
Always	Often	Sometimes	Rarely	Never

9. When using the computer at school, do you feel any discomfort or pain in your body? _____

1	2	3	4	5
Always	Often	Sometimes	Rarely	Never

10. Please circle any area where you get pain or discomfort when using a computer at school. _____

Eyes

Hand

Leg

Foot

Head

Fingers

Lower Back

Thighs

Neck

Upper Back

Mid Back

Other, Please Specify _____

11. While using a computer in class, please rate how often the teacher has asked you to do the following:

a. Take a Break _____

1	2	3	4	5
Always	Often	Sometimes	Rarely	Never

b. Stretch _____

1	2	3	4	5
Always	Often	Sometimes	Rarely	Never

c. Check to see if you are sitting properly at the computer _____

1	2	3	4	5
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Appendix C

Survey Letter to Teachers

Dear Sir or Madam:

I am conducting a survey for my thesis sponsored by Seton Hall University in South Orange, New Jersey. My purpose is to learn more about how teachers use the Internet in the classroom. You have been selected at random to participate in this survey – thus your opinions will represent the opinions of many people much like yourself.

Enclosed you will find a URL that will lead you to my questionnaire. Once you click on the URL, you will be asked to complete 10 questions. All information that you provide is strictly confidential.

I appreciate your willingness to help in this research effort. I believe you will find the questionnaire both interesting and provocative and look forward to receiving any additional input you may want to add.

Sincerely,

Nancy Bannon

Appendix D
Student Survey Instructions

Students:

A student at Seton Hall University is conducting a survey for an important study. She has asked you to fill out the questionnaire placed in front of you. The purpose of this study is to find out how you use the Internet in the classroom.

The questionnaire asks you to rate each question on a 1 through 5 scale. For example, you will circle 1 if an activity using the Internet in class always happens. You will circle 2 if the activity often happens in class. You will circle 3 if the activity sometimes happens in class. You will circle 4 if the activity rarely happens in class. Finally, you will circle 5 if the activity never happens in class.

Once you have completed the survey, please bring it to my desk.

The author of the questionnaire would like to thank you in advance for your help for this important study.